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ART UNIT	PAPER NUMBER
1733	

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Please find below and/or attached an Office communication concerning this application or proceeding.

mk -10

Office Action Summary	Application No.	Applicant(s)	
	09/930,007	OTTER, JAMES WILLIAM	
	Examiner	Art Unit	
	Gladys J Piazza Corcoran	1733	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 February 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) *7-9 and 12-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,10,11 and 21-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group I, Species IA, expanding an inner extruded tube with air in a mold to form an inner expanded tube and expanding an outer extruded tube with air in a mold to form a substantially U-shaped outer expanded mold where the ends of the tubes are thermally adhered to a norbornene flange to form one of the cells, in Paper No. 7 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

2. Claims 7-9 and 12-20 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Group II, Species IB, II and III, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 7.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 3-6, 27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 3 recites the limitation "said inner extruded tube" in line 3. There is insufficient antecedent basis for this limitation in the claim. It is suggested to amend to --said first extruded tube--.

6. Claim 6 recites the limitation "said outer ends" in line 2. There is insufficient antecedent basis for this limitation in the claim. It is suggested to amend to --said pair of ends--.

7. Claim 27 recites the limitations "said end" in line 2; "said outer ends" in line 2; "said first end". There is insufficient antecedent basis for these limitations in the claim. It is suggested to either to change the dependency of claim 27 to claim 26 or to define "said end" or "said first end" in claim 27; amend to --said pair of ends--.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fletcher et al. (US Patent No. 5,078,946) in view of Winter et al. (US Patent No. 5,696,045).

Fletcher discloses a method for making a heat transfer component (article 1) by forming a plurality of cells of a polymer and using the cells as part of a heat transfer component (column 1, lines 48-62; column 7, lines 4-19).

Although Fletcher does not specifically disclose forming the polymer cells from norbornene, Fletcher does disclose that the polymer in the automotive heat transfer component (column 1, lines 33-47) may be chosen from a variety of polymers suitable for the particular end heat transfer component including polyolefins and alloys and/or blends of polymers (column 7, lines 60-65; column 9, lines 3-26). Winter discloses a

process of forming polyolefins suitable for a variety of thermoplastic process including injection molding, extrusion, and blowmolding (column 1, lines 13-19; column 2, lines 6-19; column 11, lines 20-30) for forming a variety of articles including pipes, heat exchangers and automotive parts (column 2, lines 6-19; column 11, lines 20-30) where the polymer includes polymerized norbornene (column 10, lines 23-35). It would have been obvious to one of ordinary skill in the art at the time of the invention to one of ordinary skill in the art forming the heat transfer component of Fletcher to select use a well known and commercially available polymer such as norbornene particularly since it is known to use such a polymer for molding pipes and heat exchangers in the automotive industry as exemplified by Winter and since Fletcher suggests a variety of polymers including polyolefins may be selected according to the particular end product desired. Only the expected results would be attained.

10. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fletcher et al. in view of Winter et al. as applied to claim 1 above, and further in view of Ninomiya et al. (US Patent No. 5,525,288).

Fletcher discloses melting the polymer to form the tubes and then expanding the tubes (column 5, lines 23-54). It appears as though Fletcher discloses injection molding the polymer to form the tubes, however, extrusion molding tubes is a conventional and well known equivalent alternative to injection molding tubes. Furthermore, Ninomiya discloses it is known in the polymer molding art, particularly the automotive art for forming tubes, to extrude tubes prior to expansion molding the tubes to the final shape as an improvement over the prior art methods including injection molding the tubes in

order to manufacture simply and easily and reducing the number of steps and the cost of manufacturing (column 1, lines 10-33, column 2, lines 10-15; column 3, line 65). It would have been obvious to one of ordinary skill in the art at the time of the invention to mold the tubes in Fletcher by an extrusion method prior to expansion as it is considered a well known equivalent alternative to injection molding tubes and further exemplified by Ninomiya as an improvement and in order to reduce steps and cost of manufacturing molded tubes.

11. Claims 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fletcher et al. (US Patent No. 5,078,946) in view of Winter et al. (US Patent No. 5,696,045) as applied to claim 1 above, and further in view of Berg (US Patent No. 4,202,405) as taken with Sorensen (US Patent No. 3,779,005).

Fletcher discloses it is known to manufacture heat exchangers from a polymer as an improvement over forming heat exchangers from metal in order to reduce the weight of the exchanger (column 1, lines 12-26). Fletcher further discloses that this is particularly useful in manufacturing heat exchangers in the automobile industry (column 1, lines 11-47). Although Fletcher discloses a method of manufacturing one type of heat exchanger with straight tubes in the automobile industry (the comfort heat exchanger), it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the method of forming cells of other known heat exchangers with U shaped tubes in the automobile industry as suggested by Fletcher (column 1, lines 33-44). For example, Berg discloses a heat transfer component (air condenser 10) formed of a plurality of cells (tube bundles 11) each with a first tube (18, 19) and a

second U-shaped tube (17, 20) that is continuous (column 6, lines 24-28) and has a pair of ends with an opening (see right hand side of figure 4) and the first tube is located in the opening (see figures 1, 4, 5, 6) where the heat transfer component is one for the automotive industry (for turbine exhaust engine). Optionally, Sorensen is cited to show that air cooled condensers for exhaust steam of a turbine engine (as the one disclosed in Berg) are used in the automotive industry (column 1, lines 9-11, lines 55-57; column 5, lines 29-30). As discussed above, Fletcher discloses the tubes are expanded and Winter discloses using a norbornene polymer for the heat exchanger. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the method of forming a heat transfer component of expanded tubes of norbornene polymer as shown by Fletcher and Winter by forming the component out of a first tube and a second tube that is U-shaped as is known for forming heat exchangers in the automotive industry as exemplified by Berg as optionally taken with Sorensen particularly since Fletcher suggests using the method for heat exchangers in the automotive industry.

As to claim 25, a flue gas is defined between the tubes (column 1, lines 20-22, column 6, lines 38-45; column 7, lines 34-44). As to claim 26, Berg discloses attaching the ends of the tubes to a flange (sheet 25) to form a cell (see figure 4). As to claim 27, Fletcher discloses the flange in the cell is thermally adhered during molding and the orientation step to the polymer tubes and is made of the same polymer as the tubes (column 4, lines 55-59; column 5, lines 9-22; column 7, lines 50-60). It would have been obvious to one of ordinary skill in the art at the time of the invention to manufacture the

heat transfer component as shown in Fletcher, Winter, Berg, Sorensen with a flange of norbornene polymer since Fletcher discloses forming the flange out of the same material as the tubes and thermally adhered to the tubes.

12. Claims 2-6, 10, 11, 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fletcher et al. in view of Winter et al., Berg, Sorensen as applied to claim 24 above, and further in view of Ninomiya et al. (US Patent No. 5,525,288) and Taga (US Patent No. 3,425,092).

As to claim 2, Fletcher discloses melting the polymer to form the tubes and then expanding the tubes (column 5, lines 23-54). It appears as though Fletcher discloses injection molding the polymer to form the tubes, however, extrusion molding tubes is a conventional and well known equivalent alternative to injection molding tubes. Furthermore, Ninomiya discloses it is known in the polymer molding art, particularly the automotive art for forming tubes, to extrude tubes prior to expansion molding the tubes to the final shape as an improvement over the prior art methods including injection molding the tubes in order to manufacture simply and easily and reducing the number of steps and the cost of manufacturing (column 1, lines 10-33, column 2, lines 10-15; column 3, line 65). Taga shows another example in the art where it is known to extrusion mold tubes as an improvement over injection molding tubes, particularly when forming U-shaped tubes (column 1, lines 1-47). It would have been obvious to one of ordinary skill in the art at the time of the invention to mold the tubes as shown in Fletcher, Winter, Berg, Sorensen by an extrusion method prior to expansion as it is considered a well known equivalent alternative to injection molding tubes and further

exemplified by Ninomiya in order to reduce steps and cost of manufacturing molded tubes and Taga in order to form U-shaped tubes.

As to claim 3, Berg discloses first tubes and second U-shaped tubes as discussed above. Fletcher discloses that when the polymeric tubes are formed, they are expanded in molds to form the proper shape (column 5, lines 23-54). Ninomiya and Taga also disclose examples of extruded polymeric tubes that are expanded in molds to form the final shape. Thus the references show expanding the tubes in first and second molds with air.

As to claim 4, Fletcher discloses that the tubes have external surface discontinuities such as dimples, protrusions, etc. in order to provide turbulence to the fluid (column 7, lines 39-50). Fletcher does not specifically discloses how the discontinuities are formed, however it would have been well within the purview of one of ordinary skill in the art to mold the discontinuities during the molding step of the tubes by forming grooves into the molds to form the desired outer surface of the tubes. Only the expected results would be attained. Furthermore, Ninomiya discloses it is known in the tube forming art to provide grooves on the inner mold surfaces when extrusion molding tubes in order to provide surface discontinuities on the tubes (column 2, lines 25-43; column 3, lines 37-45). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the tubes formed in heat transfer component as shown by Ripka and Fletcher with tube grooves as shown in Fletcher in order to provide turbulence to the fluid by providing a plurality of mold grooves in the molds as is

well within the purview of one of ordinary skill in the art and well known in the art as exemplified by Ninomiya.

As to claim 5, Berg discloses that a first tube includes an end (tubes 18, 19) and a second tube with a pair of ends (tube 17, 20) where an end of the first tube and the pair of ends are attached to a flange (sheet 25; see figure 4) to form a cell (a bundle 11) where the first tube is located within the pair of ends of the second tube (see figure 4) and a flue gas passage is defined between the tubes (air flow).

As to claim 6, Fletcher discloses the flange in the cell is thermally adhered during molding and the orientation step to the polymer tubes and is made of the same polymer as the tubes (column 4, lines 55-59; column 5, lines 9-22; column 7, lines 50-60). It would have been obvious to one of ordinary skill in the art at the time of the invention to manufacture the heat transfer component as shown in Fletcher, Winter, Berg, Sorensen with a flange of norbornene polymer since Fletcher discloses forming the flange out of the same material as the tubes and thermally adhered to the tubes.

As to claim 10, all the limitations have been addressed in relation to claim 5. As to claim 11, all the limitations have been addressed in relation to claim 6. As to claim 21, the references Ninomiya (mold sections 40, 41) and Taga (mold halves a) both show when forming tubes by extruding and expanding to position the extruded tube in a bottom portion of a first mold and placing the top portion on the bottom portion to retain the tube there between. As to claim 22, the second U-shaped tube in Berg is continuous (column 6, lines 24-28). As to claim 23, Berg discloses multiple cells, thus Berg discloses a second cell with air flow passage between the cells (air flow).

13. Claims 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fletcher et al. (US Patent No. 5,078,946) in view of Winter et al. (US Patent No. 5,696,045) as applied to claim 1 above, and further in view of Larinoff (US Patent No. 5,787,970) and Berg (US Patent No. 4,202,405) as taken with Sorensen (US Patent No. 3,779,005).

Fletcher discloses it is known to manufacture heat exchangers from a polymer as an improvement over forming heat exchangers from metal in order to reduce the weight of the exchanger (column 1, lines 12-26). Fletcher further discloses that this is particularly useful in manufacturing heat exchangers in the automobile industry (column 1, lines 11-47). Although Fletcher discloses a method of manufacturing one type of heat exchanger with straight tubes in the automobile industry (the comfort heat exchanger), it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the method of forming cells of other known heat exchangers with U shaped tubes in the automobile industry as suggested by Fletcher (column 1, lines 33-44). For example, Larinoff discloses a heat transfer component (air-cooled heat exchanger) formed of a plurality of cells (tube bundles 16) each with a first tube (row 10.2) and a second U-shaped tube (row 10.1 and 10.3) and has a pair of ends with an opening (see figure 8) and the first tube is located in the opening (see figure8) where the heat transfer component is one for the automotive industry (for turbine engine). As to the limitation that the second U-shaped tube is continuous, Larinoff discloses that the second tube has two legs connected with a U shaped connector (see figure 8), however it is well known in the art to provide a continuous tube as an equivalent alternative. For

example, Berg discloses that U-shaped tubes can alternately be formed by an integral shaped tube or two legs of a tube connected with a connector (column 6, lines 24-28). It would have been obvious to one of ordinary skill in the art at the time of the invention to form the heat exchanger U-shape tube of Larinoff with a continuous tube as an equivalent alternative to two tubes connected by a U shape member as exemplified by Berg. Optionally, Sorensen is cited to show that air cooled condensers for exhaust steam of a turbine engine (as the one disclosed in Berg) are used in the automotive industry (column 1, lines 9-11, lines 55-57; column 5, lines 29-30).

As discussed above, Fletcher discloses the tubes are expanded and Winter discloses using a norbornene polymer for the heat exchanger. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the method of forming a heat transfer component of expanded tubes of norbornene polymer as shown by Fletcher and Winter by forming the component out of a first tube and a second tube that is U-shaped as is known for forming heat exchangers in the automotive industry as exemplified by Larinoff and Berg as optionally taken with Sorensen particularly since Fletcher suggests using the method for heat exchangers in the automotive industry.

As to claim 25, a flue gas is defined between the tubes (column 3, lines 23-25). As to claim 26, Larinoff discloses attaching the ends of the tubes to a flange (sheet 12) to form a cell (see figure 8). As to claim 27, Fletcher discloses the flange in the cell is thermally adhered during molding and the orientation step to the polymer tubes and is made of the same polymer as the tubes (column 4, lines 55-59; column 5, lines 9-22;

column 7, lines 50-60). It would have been obvious to one of ordinary skill in the art at the time of the invention to manufacture the heat transfer component as shown in Fletcher, Winter, Larinoff, Berg, Sorensen with a flange of norbornene polymer since Fletcher discloses forming the flange out of the same material as the tubes and thermally adhered to the tubes.

14. Claims 2-6, 10, 11, 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fletcher et al. in view of Winter et al., Larinoff, Sorensen as applied to claim 24 above, and further in view of Ninomiya et al. (US Patent No. 5,525,288) and Taga (US Patent No. 3,425,092).

It is noted that the reference Berg is not required for the following claims.

As to claim 2, Fletcher discloses melting the polymer to form the tubes and then expanding the tubes (column 5, lines 23-54). It appears as though Fletcher discloses injection molding the polymer to form the tubes, however, extrusion molding tubes is a conventional and well known equivalent alternative to injection molding tubes. Furthermore, Ninomiya discloses it is known in the polymer molding art, particularly the automotive art for forming tubes, to extrude tubes prior to expansion molding the tubes to the final shape as an improvement over the prior art methods including injection molding the tubes in order to manufacture simply and easily and reducing the number of steps and the cost of manufacturing (column 1, lines 10-33, column 2, lines 10-15; column 3, line 65). Taga shows another example in the art where it is known to extrusion mold tubes as an improvement over injection molding tubes, particularly when forming U-shaped tubes (column 1, lines 1-47). It would have been obvious to one of

ordinary skill in the art at the time of the invention to mold the tubes as shown in Fletcher, Winter, Larinoff, Sorensen by an extrusion method prior to expansion as it is considered a well known equivalent alternative to injection molding tubes and further exemplified by Ninomiya in order to reduce steps and cost of manufacturing molded tubes and Taga in order to form U-shaped tubes.

As to claim 3, Larinoff discloses first tubes and second U-shaped tubes as discussed above. Fletcher discloses that when the polymeric tubes are formed, they are expanded in molds to form the proper shape (column 5, lines 23-54). Ninomiya and Taga also disclose examples of extruded polymeric tubes that are expanded in molds to form the final shape. Thus the references show expanding the tubes in first and second molds with air.

As to claim 4, Fletcher discloses that the tubes have external surface discontinuities such as dimples, protrusions, etc. in order to provide turbulence to the fluid (column 7, lines 39-50). Fletcher does not specifically discloses how the discontinuities are formed, however it would have been well within the purview of one of ordinary skill in the art to mold the discontinuities during the molding step of the tubes by forming grooves into the molds to form the desired outer surface of the tubes. Only the expected results would be attained. Furthermore, Ninomiya discloses it is known in the tube forming art to provide grooves on the inner mold surfaces when extrusion molding tubes in order to provide surface discontinuities on the tubes (column 2, lines 25-43; column 3, lines 37-45). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the tubes formed in heat transfer component

as shown by Ripka and Fletcher with tube grooves as shown in Fletcher in order to provide turbulence to the fluid by providing a plurality of mold grooves in the molds as is well within the purview of one of ordinary skill in the art and well known in the art as exemplified by Ninomiya.

As to claim 5, Larinoff discloses that a first tube includes an end (tube 10.2) and a second tube with a pair of ends (tubes 10.3, 10.1) where an end of the first tube and the pair of ends are attached to a flange (sheet 12; see figure 8) to form a cell (a bundle 16) where the first tube is located within the pair of ends of the second tube (see figure 8) and a flue gas passage is defined between the tubes (air flow).

As to claim 6, Fletcher discloses the flange in the cell is thermally adhered during molding and the orientation step to the polymer tubes and is made of the same polymer as the tubes (column 4, lines 55-59; column 5, lines 9-22; column 7, lines 50-60). It would have been obvious to one of ordinary skill in the art at the time of the invention to manufacture the heat transfer component as shown in Fletcher, Winter, Larinoff, Sorensen with a flange of norbornene polymer since Fletcher discloses forming the flange out of the same material as the tubes and thermally adhered to the tubes.

As to claim 10, all the limitations have been addressed in relation to claim 5. As to claim 11, all the limitations have been addressed in relation to claim 6. As to claim 21, the references Ninomiya (mold sections 40, 41) and Taga (mold halves a) both show when forming tubes by extruding and expanding to position the extruded tube in a bottom portion of a first mold and placing the top portion on the bottom portion to retain

the tube there between. As to claim 23, Larinoff discloses multiple cells, thus Larinoff discloses a second cell with air flow passage between the cells (air flow).

15. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fletcher et al. in view of Winter et al., Larinoff, Sorensen, Ninomiya and Taga as applied to claim 5 above, and further in view of Berg (US Patent No. 4,202,405).

Larinoff discloses that the second tube has two legs connected with a U shaped connector (see figure 8), however it is well known in the art to provide a continuous tube as an equivalent alternative. For example, Berg discloses that U-shaped tubes can alternately be formed by an integral shaped tube or two legs of a tube connected with a connector (column 6, lines 24-28). It would have been obvious to one of ordinary skill in the art at the time of the invention to form the heat exchanger U-shape tube of Larinoff with a continuous tube as an equivalent alternative to two tubes connected by a U shape member as exemplified by Berg.

16. Claims 1, 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ripka et al. (US Patent No. 5,038,750) in view of Fletcher et al. (US Patent No. 5,078,946) in view of Winter et al. (US Patent No. 5,696,045).

Ripka discloses a heat transfer component with first tubes (straight pipes 201 or U-shaped pipes 201 below the radiant burner 15) and outer U-shaped tubes (pipe 201a) forming a plurality of cells. Ripka discloses the heat transfer component is formed of suitable materials including copper and aluminum (column 6, lines 39-53).

Fletcher discloses that in a method for making a heat transfer component (article 1) by forming a plurality of cells and using the cells as part of a heat transfer component

where a polymer material is used for forming the cells instead of a metal in order to reduce the weight of the heat exchanger (column 1, lines 24-32, 48-62; column 7, lines 4-19). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the method of forming a heat transfer component as shown by Ripka out of a polymer material that is formed into a plurality of cells to form the heat transfer component as shown in Fletcher in order to provide a lighter weight component.

Although Fletcher does not specifically disclose forming the polymer cells from norbornene, Fletcher does disclose that the polymer in the automotive heat transfer component (column 1, lines 33-47) may be chosen from a variety of polymers suitable for the particular end heat transfer component including polyolefins and alloys and/or blends of polymers (column 7, lines 60-65; column 9, lines 3-26). Winter discloses a process of forming polyolefins suitable for a variety of thermoplastic process including injection molding, extrusion, and blow molding (column 1, lines 13-19; column 2, lines 6-19; column 11, lines 20-30) for forming a variety of articles including pipes, heat exchangers and automotive parts (column 2, lines 6-19; column 11, lines 20-30) where the polymer includes polymerized norbornene (column 10, lines 23-35). It would have been obvious to one of ordinary skill in the art at the time of the invention to one of ordinary skill in the art forming the heat transfer component of Fletcher to select use a well known and commercially available polymer such as norbornene particularly since it is known to use such a polymer for molding pipes and heat exchangers in the automotive industry as exemplified by Winter and since Fletcher suggests a variety of

polymers including polyolefins may be selected according to the particular end product desired. Only the expected results would be attained.

As to claim 24, Ripka discloses forming a plurality of cells (each pair of U-shaped tubes) for a heat transfer component where each of the cells includes a first tube (the U-shaped tubes below the radiant burner 15) and a second U-shaped tube (the U-shaped tubes above the radiant burner 15) that is continuous and has a pair of ends and an opening where the first tube is located in the opening (see figure 2). Fletcher discloses the cells are expanded and Winter discloses forming the tubes out of norbornene polymer as discussed above. As to claim 25, the flue gas passage is between the tubes (flue gas form radiant burner 15). As to claim 26, Ripka discloses an end of the first tube and the pair of ends are attached to a flange (back wall of heating chamber 14; see figure 2) to form a plurality of cells (each pair of U-tubes). As to claim 27, Fletcher discloses the flange in the cell is thermally adhered during molding and the orientation step to the polymer tubes and is made of the same polymer as the tubes (column 4, lines 55-59; column 5, lines 9-22; column 7, lines 50-60). It would have been obvious to one of ordinary skill in the art at the time of the invention to manufacture the heat transfer component as shown in Ripka, Fletcher, and Winter with a flange of norbornene polymer since Fletcher discloses forming the flange out of the same material as the tubes and thermally adhered to the tubes.

17. Claims 2-6, 10, 11, 21-23 rejected under 35 U.S.C. 103(a) as being unpatentable over Ripka et al. in view of Fletcher et al. and Winter et al. as applied to claims 1 and.24

above, and further in view of Ninomiya et al. (US Patent No. 5,525,288) and Taga (US Patent No. 3,425,092).

As to claim 2, Fletcher discloses melting the polymer to form the tubes and then expanding the tubes (column 5, lines 23-54). It appears as though Fletcher discloses injection molding the polymer to form the tubes, however, extrusion molding tubes is a conventional and well known equivalent alternative to injection molding tubes. Furthermore, Ninomiya discloses it is known in the polymer molding art, particularly the automotive art for forming tubes, to extrude tubes prior to expansion molding the tubes to the final shape as an improvement over the prior art methods including injection molding the tubes in order to manufacture simply and easily and reducing the number of steps and the cost of manufacturing (column 1, lines 10-33, column 2, lines 10-15; column 3, line 65). Taga shows another example in the art where it is known to extrusion mold tubes as an improvement over injection molding tubes, particularly when forming U-shaped tubes (column 1, lines 1-47). It would have been obvious to one of ordinary skill in the art at the time of the invention to mold the tubes in Ripka and Fletcher by an extrusion method prior to expansion as it is considered a well known equivalent alternative to injection molding tubes and further exemplified by Ninomiya in order to reduce steps and cost of manufacturing molded tubes and Taga in order to form U-shaped tubes.

As to claim 3, Ripka discloses first tubes and second U-shaped tubes as discussed above. Fletcher discloses that when the polymeric tubes are formed, they are expanded in molds to form the proper shape (column 5, lines 23-54). Ninomiya and

Taga also disclose examples of extruded polymeric tubes that are expanded in molds to form the final shape. Thus the references show expanding the tubes in first and second molds with air.

As to claim 4, Fletcher discloses that the tubes have external surface discontinuities such as dimples, protrusions, etc. in order to provide turbulence to the fluid (column 7, lines 39-50). Fletcher does not specifically discloses how the discontinuities are formed, however it would have been well within the purview of one of ordinary skill in the art to mold the discontinuities during the molding step of the tubes by forming grooves into the molds to form the desired outer surface of the tubes. Only the expected results would be attained. Furthermore, Ninomiya discloses it is known in the tube forming art to provide grooves on the inner mold surfaces when extrusion molding tubes in order to provide surface discontinuities on the tubes (column 2, lines 25-43; column 3, lines 37-45). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the tubes formed in heat transfer component as shown by Ripka and Fletcher with tube grooves as shown in Fletcher in order to provide turbulence to the fluid by providing a plurality of mold grooves in the molds as is well within the purview of one of ordinary skill in the art and well known in the art as exemplified by Ninomiya.

As to claim 5, Ripka discloses that a first tube includes an end (U-shaped tubes 201 below radiant burner 15) and a second tube with a pair of ends (U-shaped tubes above radiant burner 15) where an end of the first tube and the pair of ends are attached to a flange (back wall of heating chamber 14; see figure 2) to form a cell (a pair

of U-tubes) where the first tube is located within the pair of ends of the second tube (see figure 2) and a flue gas passage is defined between the tubes (flue gas from radiant burner 15).

As to claim 6, Fletcher discloses the flange in the cell is thermally adhered during molding and the orientation step to the polymer tubes and is made of the same polymer as the tubes (column 4, lines 55-59; column 5, lines 9-22; column 7, lines 50-60). It would have been obvious to one of ordinary skill in the art at the time of the invention to manufacture the heat transfer component as shown in Ripka, Fletcher, and Winter with a flange of norbornene polymer since Fletcher discloses forming the flange out of the same material as the tubes and thermally adhered to the tubes.

As to claim 10, all the limitations have been addressed in relation to claim 5. As to claim 11, all the limitations have been addressed in relation to claim 6. As to claim 21, the references Ninomiya (mold sections 40, 41) and Taga (mold halves a) both show when forming tubes by extruding and expanding to position the extruded tube in a bottom portion of a first mold and placing the top portion on the bottom portion to retain the tube there between. As to claim 22, the second U-shaped tube in Ripka is continuous. As to claim 23, Ripka discloses multiple pairs of U-shaped tubes, thus Ripka discloses a second cell with air flow passage between the cells (flue gas from radiant burner 15).

Response to Arguments

18. Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues on page 6 that it would not be obvious to form the heat exchanger in Fletcher form norbornene polymer in view of Ueno. The new rejection is based on Winter which discloses a polymer with norbornene that is used for heat exchangers, thus it would have been obvious as discussed above to form the heat exchanger of Fletcher with norbornene polymer.

Applicant argues on page 7 that Ripka disclose that the pipes are formed of copper and that there is no suggestion in Ripka to form the pipes out of a polymer such as norbornene. As discussed above, the reference Fletcher clearly suggests to one of ordinary skill in the art to form metal heat exchanger tubes out of polymer in order to reduce weight. Winter further shows that polymers of norbornene are known for forming heat exchangers.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gladys J Piazza Corcoran whose telephone number is (703) 305-1271. The examiner can normally be reached on M-F 8am-5:30pm (alternate Fridays off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Ball can be reached on (703) 308-2058. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gladys J Piazza Corcoran
Examiner
Art Unit 1733

Gladys JP Corcoran
April 16, 2003